

REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-4, 6-17, 19, and 20 are presently active in this case, Claim 7 having been amended, Claim 18 having been canceled without prejudice or disclaimer, and Claims 19 and 20 having been added by way of the present Amendment. Claim 18 was canceled, since it was determined to be a duplicate of Claim 8.

Care has been taken such that no new matter has been entered. Support for the amendment to Claim 7 can be found, for example, in Figure 8, and support for the new claims can be found, for example, on page 1, last line, through page 2, line 9, and page 8, lines 14-22.

In the outstanding Official Action, Claims 1-3 were rejected under 35 U.S.C. 103(a) as being unpatentable over Wakita et al. (U.S. Patent No. 6,299,682) in view of Gross et al. (U.S. Patent No. 6,547,849). Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Wakita et al. in view of Gross et al. and further in view of Baum (U.S. Patent No. 4,140,170). For the reasons discussed below, the Applicants traverse the obviousness rejections.

The basic requirements for establishing a *prima facie* case of obviousness as set forth in MPEP 2143 include (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the

art, to modify the reference or to combine reference teachings, (2) there must be a reasonable expectation of success, and (3) the reference (or references when combined) must teach or suggest all of the claim limitations. Furthermore, the proposed modification cannot change the principle of operation of a reference.

The Applicant submits that a *prima facie* case of obviousness has not been established in the present case because there is no suggestion or motivation to combine the references in the suggested manner, as the proposed modification would be contrary to the teachings of the Wakita et al. reference and the modification would change the principle of operation of the Wakita et al. reference.

The Wakita et al. reference is presumably cited for the teaching of all of the features recited in independent Claims 1 and 9, except for a lid which is disposed horizontally between the surface of a molten metal and a heater, and a lid moving structure which moves the lid relatively to the die and controls an opening amount of the opening section above the die, as recited in Claim 1; and a lid configured to be disposed between the surface of a molten liquid and a heater, and means for adjusting an opening amount of the opening section according to a flow amount of the inert gas to the surface of the molten metal, as recited in Claim 9. The Official Action cites the Gross et al. reference to supplement the above deficiencies in the teachings of the Wakita et al. reference.

The Gross et al. reference describes a steel charge and slag forming material that is heated and refined in a ladle (17) using a ladle metallurgical furnace (10) to form a molten

steel bath covered by slag. The steel charge or bath is heated within the ladle (17) by a vertically oriented electrode (38), which is supported by a conducting arm (36) and an electrode column (39). In operation, as column (39) lowers, electrode (38) is lowered through an aperture in the furnace hood or exhaust (34) and an aperture in the furnace lid (32) into the ladle (17) and beneath the slag in order to heat the metal within the ladle (17).

The Gross et al. reference describes various components that act as heat shields to protect the components that are outside of the ladle (17) from the heat generated by the electrode (38) within the ladle (17). For example, the Gross et al. reference describes a "heat shield 41 that protects the electrode support and regulating components from the heat generated by the furnace." (Column 4, lines 31-33.) The Gross et al. reference then goes on to describe that various furnace components, such as the furnace lid (32), the lift cylinder (33), and the conducting arm (36), are water cooled. (Column 4, lines 35-37.) Thus, the Gross et al. reference clearly teaches the use a lid (32) that is water cooled and therefore prevents or reduces the amount of heat escaping the ladle (17) in order to protect the components around the furnace. The Gross et al. reference is able to achieve heating of the material within the ladle (17) by inserted the electrode (38) through a hole in the lid (32) and inserting the electrode (38) directly into the material within the ladle (17).

The Wakita et al. reference describes a completely different heater configuration that is configured to achieve a very specific and precise heating and solidification of a silicon raw material in the crucible thereof. The Wakita et al. reference describes a silicon raw material

that is placed into a crucible of a melting device constructed by mounting a chill plate (15) on a underfloor heater (13), mounting a crucible (14) having a wide horizontal cross-sectional area on the chill plate (15), providing an overhead heater (16) over the crucible (14), and surrounding the circumference of the crucible (14) with a heat insulator (17). The silicon raw material is heat-melted by flowing an electric current through the underfloor heater (13) and overhead heater (16). A silicon ingot having a directional solidification structure can be produced by halting the electric current or reducing the electric power after completely melting the silicon raw material to form the molten silicon (8), followed by flowing an inert gas through the chill plate (15) to chill the molten silicon from the bottom of the crucible by chilling the bottom of the crucible, along with intermittently or continuously decreasing the temperature of the overhead heater (16) by intermittently or continuously reducing the electric current flow through the overhead heater (16).

The Wakita et al. reference provides such a structure in order to very precisely control the solidification of the silicon in the crucible to achieve a directional solidification structure grown from the bottom to the top of the crucible. (See, e.g., column 6, lines 16-41, thereof.) The placement of the water cooled lid (32) of the Gross et al. reference in between the overhead heater (16) and the top of the crucible (14) of the Wakita et al. reference would prevent the structure of the Wakita et al. reference from operating in the intended manner, as it would insulate crucible (14) from the heat from the heater (16) and completely change the solidification of the silicon in the crucible (14). Note that the only insulator that is described

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in the Wakita et al. reference is heat insulator (17), and that the heater (16) is not obstructed from being directly overhead of the top opening of the crucible (14). One of skill in the art would not have been motivated to incorporate the water cooled lid (32) of the Gross et al. reference into the silicon heating device described in the Wakita et al. reference, since such a lid (32) would have prevented the heating device of the Wakita et al. reference from operating in its intended manner. (See MPEP 2143.01 V. and VI.)

The Applicants respectfully submit that the rejection is based on the improper application of hindsight considerations. It is well settled that it is impermissible simply to engage in hindsight reconstruction of the claimed invention, using Applicants' structure as a template and selecting elements from the references to fill in the gaps. *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991). Recognizing, after the fact, that a modification of the prior art would provide an improvement or advantage, without suggestion thereof by the prior art, rather than dictating a conclusion of obviousness, is an indication of improper application of hindsight considerations. Simplicity and hindsight are not proper criteria for resolving obviousness. *In re Warner*, 397 F.2d 1011, 154 USPQ 173 (CCPA 1967).

Accordingly, the Applicants respectfully request the withdrawal of the obviousness rejections of independent Claims 1 and 9.

The dependent claims are considered allowable for the reasons advanced for the independent claims from which they respectively depend. These claims are further

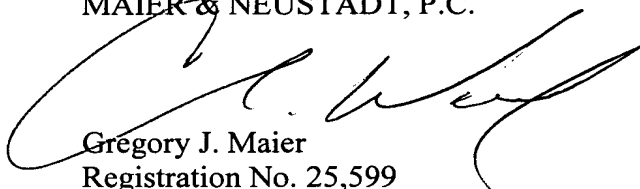
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considered allowable as they recite other features of the invention that are neither disclosed nor suggested by the applied references when those features are considered within the context of their respective independent claim.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully Submitted,

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